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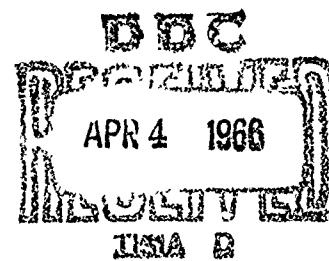
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479630



U.S. Army Infantry Human Research Unit Fort Benning, Georgia

Under the Technical Supervision of

**The George Washington University
HUMAN RESOURCES RESEARCH OFFICE
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THE DEPARTMENT OF THE ARMY**

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RESEARCH MEMORANDUM

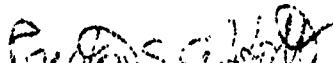
Extension of Research in TRAINFIRE I
Basic Rifle Marksmanship Course

By

Staff, U.S. Army Infantry Human Research Unit

December 1958

Approved:



PRESTON S. ABBOTT
Director of Research

U.S. Army Infantry
Human Research Unit
Fort Benning, Georgia

Number 8

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COMPOSITION OF RESEARCH TEAM

Dr. Howard H. McFann was Task Leader and Subtask Leader for this administration. The staff consisted of:

Dr. Donald Buchanan
Dr. J. Daniel Lyons
Mr. Joseph S. Ward
Mr. Charles Waits
SP3 Salvatore N. Cianci*
Pfc Martin D. Steinberg*
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Dr. Francis E. Jones was Director of Research and Lt Col Edgar S. Sanders was Military Chief at the Infantry Human Research Unit while these studies were being conducted.

* Enlisted Scientific and Professional Personnel

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Extension of Research in TRAINFIRE I
Basic Rifle Marksmanship Course

INTRODUCTION

This is the second report on TRAINFIRE I: A New Course in Basic Rifle Marksmanship. Details of the original TRAINFIRE I program are given in Technical Report 22, and any statement concerning the original TRAINFIRE I refers to that report.^{1/}

The mission of Task TRAINFIRE is to develop methods and proficiency tests to improve the effectiveness of combat rifle marksmanship. The research encompasses:

1. Determining the specific skills and knowledges that the individual must acquire to utilize the rifle effectively in combat.
2. Developing a program for training the necessary skills and knowledges.
3. Constructing combat-oriented proficiency tests.

Task TRAINFIRE consists of these Subtasks involving experimental development of:

TRAINFIRE I A course of basic individual rifle marksmanship.

TRAINFIRE II A program of basic daylight squad technique of rifle fire and tactical training.

^{1/} McNann, Howard H., Hammes, John A., and Taylor, John E. TRAINFIRE I: A New Course in Basic Rifle Marksmanship, HumRRO Technical Report 22, October 1955.

TRAINFIRE III A program of squad sniper training for selected riflemen.

TRAINFIRE IV A training program for the specialist sniper.

TRAINFIRE V An improved version of TRAINFIRE I: the individual rifle marksmanship course.

TRAINFIRE VI An improved version of TRAINFIRE II: basic daylight technique of rifle fire and squad tactical training.

Briefly, the training program consisted of (a) having the trainee fire early in training, (b) combining preliminary rifle instruction with training on the 1000-inch range, (c) employing the 1000-inch range to teach accuracy and other marksmanship techniques, (d) emphasizing target detection training, and (e) firing at ground level silhouette pop-up targets from both supported and unsupported ground level positions. At the completion of the TRAINFIRE I training, the group trained by the experimental methods scored significantly higher on combat-oriented proficiency tests than did the conventionally trained group.

This Research Memorandum reports work and revisions only on the TRAINFIRE I program which occurred during the fall of 1955 subsequent to the preparation of Technical Report 22 for TRAINFIRE I. On 26 July 1957, the Commanding General, Continental Army Command, directed that TRAINFIRE I be implemented as the basic rifle marksmanship course of the Army. The course as adopted included changes resulting from the program reported herein.

BACKGROUND

Information obtained from the original administration of the TRAINFIRE I program suggested several possible revisions. The evaluation of the original program had consisted of a comparison of the training effects of the program with the effects of the known distance rifle marksmanship course, effective in ATP 21-114 (dated 26 January 1954). As it was necessary to train personnel in individual rifle marksmanship to secure properly trained subjects for the TRAINFIRE II program, it was decided to utilize this administration for evaluation of the revisions of TRAINFIRE I. A comparison of the two individual marksmanship programs, known distance and revised TRAINFIRE I, could be made by determining their relative effects at the end of the first four weeks of basic training prior to training in squad techniques and tactics.

RESEARCH METHOD

Subjects

Following induction at Fort Jackson, South Carolina, 220 basic trainees were assigned to Fort Benning as subjects for this study. Restrictions placed on the selection of these troops eliminated:

1. Individuals having prior military service.
2. Conscientious objectors.
3. Assignments inconsistent with a ratio of six Caucasians to one Negro.

Procedure

The trainees were divided into two groups. One group, designated as conventional, received the known distance rifle marksmanship course and the other, designated as experimental, received the revised TRAINFIRE I rifle marksmanship course. After the first four weeks of basic training, the groups were administered target detection and the TRAINFIRE I marksmanship proficiency tests.^{1/} Both platoons of the conventional group and one platoon of the experimental group fired Rifle Marksmanship Course A as their Known Distance Record Course. The experimental group fired the Known Distance Record Course to determine how well qualified a TRAINFIRE trained man would be to fire the conventional rifle marksmanship record course. The conventional (KD) group fired on this range prior to firing marksmanship proficiency. Also, these troops trained on the Known Distance system received orientation firing which introduced them to the silhouette target before they fired the TRAINFIRE record course. The experimental platoon fired the TRAINFIRE I marksmanship proficiency test before firing the Known Distance Record Course. This group had instruction and dry firing in sustained firing but no live practice before firing for the Known Distance Record.

^{1/} At the end of the second four weeks, during which both groups received TRAINFIRE II marksmanship training, the groups were again given proficiency tests in target detection and marksmanship. No results of the tests after the second four weeks are reported since these are confounded with the effects of TRAINFIRE II.

The 7 officers and 20 enlisted men composing the cadre were divided into two groups equal in instructor experience. One group administered training to the experimental group; the other, to the conventional group.

Conventional Training

Rifle Marksmanship Course A, as specified in FM 23-5, 17 November 1954, with change 1, was the training received by the conventional group. This included 30 hours of Preliminary Rifle Instruction, 11 hours and 77 rounds of 1000-inch firing, 20 hours and 203 rounds of Known Distance firing, and 28 hours and 198 rounds of transition firing for a total of 89 hours and 478 rounds.

Experimental Training

The program followed by the experimental group included 80 hours and 450 rounds. An outline of the program follows:

Period 1: hours 1-2; 0 rounds

Orientation - excerpts from combat films; nomenclature and operation of M1.

Period 2: hours 3-6; 3 rounds

Marksmanship Preparatory Training, M1 Rifle - range and safety procedures; eight factors of steady hold; recoil and firing demonstration into half-bull's eye target; 1000-inch firing practice followed by analysis and discussion of errors.

Period 3: hours 7-10; 0 rounds

Mechanical Training, M1 Rifle - description, disassembly, assembly, functioning, operation, stoppages, immediate action, care and cleaning.

Period 4: hours 11-16; 18 rounds

Marksmanship Preparatory Training, M1 Rifle - practice in steady hold and sighting and aiming from prone position; 1000-inch firing practice in prone position followed by critique, discussion and review.

Period 5: hours 17-22; 24 rounds

Marksmanship Preparatory Training, M1 Rifle - 1000-inch firing practice from supported and unsupported prone, and supported and unsupported squatting positions.

Target Detection, initial instruction and practice in the locating and marking of single target indications (sound, smoke, dust, flash, etc.).

Period 6: hours 23-28; 24 rounds

Marksmanship Preparatory Training, M1 Rifle - 1000-inch firing practice using modified sitting position both supported and unsupported, and standing unsupported and foxhole supported positions.

Target Detection - instruction and practice in detecting motionless camouflaged targets, including integrated training in the avoidance of detection through proper techniques - camouflage, position selection and deliberate movement.

Period 7: hours 29-32; 24 rounds

Test in Components of Shooting - Review of 1000-inch firing from prone, standing, squatting, and modified sitting positions both supported and unsupported.

Instruction in positions and zeroing procedures for those trainees scoring in the lowest 50 per cent.

Period 8: hours 33-36; 16 rounds

Battle Sight Zero - weapons are zeroed for 250 yards for use at ranges up to 300 yards by firing at 75 yards on a 3" high x 2-3/4" wide paster using the bottom of paster aim for a top of paster strike.

Period 9: hours 37-44; 54 rounds

Marksmanship Training, Field Firing - firing from the various positions used, both supported and unsupported, on pop-up targets at 75, 175, and 300 yards.

Advanced Target Detection - instruction and practice in marking the location of a disappearing target involving decision as to whether to fire at the point of disappearance or wait until the target reappears.

Corrective 1000-inch firing first from supported prone, then from positions presenting difficulty to individual trainees requiring additional accuracy training.

Period 10: hours 45-48; 36 rounds

Marksmanship Training, Field Firing, Simulated Advance of Stationary Targets - firing from foxhole and unsupported squatting and modified sitting positions on stationary pop-up targets successively at 300, 175 and 75 yards.

Advanced Target Detection - instruction and practice in detecting multiple target indications including lateral movement and spotting points of disappearance after a rush.

Additional 1000-inch firing practice for those trainees scoring in the lowest 50 per cent in firing from the standing foxhole and the unsupported prone, squatting, and modified sitting positions.

Period 11: hours 49-52; 36 rounds

Marksmanship Training, Field Firing on Surprise

Targets - firing from foxhole and unsupported squatting and modified sitting positions on pop-up targets at 75, 175, and 300 yards.

Advanced Target Detection - instruction and practice detecting targets employing skilled movement from the point of disappearance before reappearance.

Period 12: hours 53-56; 24 rounds

Marksmanship Training, Timed Field Firing on Surprise

Targets - firing from various positions both supported and unsupported on pop-up targets at 75, 175, and 300 yards.

Corrective Marksmanship Instruction - trainees still unable to obtain a good shot group are given additional 1000-inch instruction and practice in sighting, aiming, steady hold factors, and trigger control.

Period 13: hours 57-60; 30 rounds

Marksmanship Training, Field Firing on Surprise

Stationary Targets - practice when moving forward in firing from various positions both supported and unsupported on pop-up targets at 75, 175, and 300 yards.

Advanced Target Detection - practice in sound localization of rifle fire and detection of other trainees acting as targets.

Camouflage - instruction emphasizing the necessity of overcoming three major problems: shine, regularity of outline, and color contrast.

Period 14: hours 61-64; 49 rounds

Marksmanship Training, Field Firing on Distant Stationary Targets - practice in firing at medium and long distance targets from a defensive position.

Corrective Marksmanship Instruction and confirmation of the zeros of firers not hitting silhouette type targets.

Period 15: hours 65-68; 24 rounds

Marksmanship Training, Area Firing - practice firing at a 1000-inch U.S. rifle cal. .30 M1 target (fig. 117, TM 9-885, Nov 51).

Period 16: hours 69-72; 32 rounds

Area Firing on Field Type Targets - firing at four silhouette targets simultaneously exposed at 75, 175, and 300 yards.

Advanced Target Detection Training - practice in detecting and estimating the range of targets moving in different directions at various speeds.

Period 17: hours 73-80; 56 rounds

Test (Record) Course, Marksmanship Proficiency

Test (Record) Course, Target Detection Proficiency

Modifications of the Experimental Program

The essential modifications of the experimental program from the 1954 original version were:^{1/}

1. The revised program increased the number of rounds to be fired from 343 to 394. The ammunition required for proficiency testing is excluded. This permitted additional firing at 1000 inches to develop initial accuracy and additional field firing under more difficult conditions.
2. The number of hours devoted to target detection was increased from 4 to 12 to include additional instruction, while the number of trials used in the target detection proficiency test was reduced from 14 to 12.
3. Three ranges, 75, 175, and 300 yard distances, were used instead of the five range distances previously used.
4. The use of moving targets was discontinued. The results of the original TRAINFIRE I program^{2/} indicated that considerably more time and ammunition would be required to develop skill in hitting high-speed targets moving perpendicular to the axis of fire. Moving personnel targets which require the use of lead techniques are rarely encountered within rifle range in combat.

^{1/} Detailed lesson plans are available on request.

^{2/} McFann, Howard H., Hammes, John A., and Taylor, John E. TRAINFIRE I: A New Course in Basic Rifle Marksmanship, HumRRO Technical Report 22, October 1955.

Instead, the laterally moving targets can usually be more profitably engaged by marking the point of disappearance and firing at this point or at the target as it reappears before it starts to change position. It was concluded that the labor and cost to develop satisfactory moving-target devices possibly would not be justified.

5. The squatting position was employed over the kneeling position to permit the firer maximum flexibility in varying his elevation to achieve visibility of the target under differing terrain conditions. In combat it also would facilitate the firer's reaction to emergency conditions, and avoid the necessity of additional contact with unfavorable ground conditions such as ice, mud, thorns, or rock.

6. The existing sitting position was modified in an effort to give greater stability, and, therefore, more accuracy.

7. Other changes, primarily administrative and specific to individual periods, were minor.

Target Detection Proficiency Test

The target detection proficiency range (see Figure 7, HumRRO Technical Report 22), located near the firing range, was a wide sector of rolling terrain which provided cover out to a range of 350 yards.

To facilitate reference and scoring, natural landmarks such as bushes, trees, or hedges were identified by two-foot letters.

The targets^{1/} to be detected were stationed distal to these letters. The letters served only as reference points by which the trainees reported the directional location of detected targets.

In the selection of target locations, a major consideration was that each target be visible from all points of the observation line. The target locations afforded scanty concealment for a motionless target. Targets were dispersed over the entire sector to avoid concentration in one range or direction.

Other than the utilization of different tracts of land, the primary difference between the training range and the test range lay in the relative difficulty of detecting targets. Though both areas were sparsely covered with bushes and tall grass, the vegetation was more dense on the test range. The targets on the test range also appeared in a different sequence and at distances different from those on the training range.

The target detection test consisted of twelve trials. Each target appeared in four phases of progressively decreasing difficulty (each lasting 30 seconds) selected to represent realistic indications. In phase 1, the target aiming at the subjects, remained motionless. The target in phase 2 made correct combat-type movements. In phase 3, the target moved rapidly or tended to disclose the position by permitting the reflection of light on an object such as a helmet or a rifle barrel. Finally, in phase 4, the target fired one or more blank rounds at the trainees.

1/ Camouflaged and trained soldiers

At the end of each phase, the trainees were given time to record the location and range of a detected target. Once a trainee had recorded his answer, he turned away indicating detection of the target. An assistant instructor checked the target location recorded by the trainee against the actual location.

Target detection training was completed prior to marksmanship proficiency testing.

Marksmanship Proficiency Test

The marksmanship proficiency test range (see Figure 5, HumRRO Technical Report 22) was constructed, restricted by measurement and safety, to approximate as closely as possible the situation encountered by the rifleman in daylight combat firing.

Pop-up targets were emplaced at 50-yard intervals, from 50 to 350 yards, leaving the natural terrain undisturbed. The olive-drab target silhouettes blended readily into the background foliage or brush. The element of surprise was introduced by exposing the targets in a mixed order and by varying the time intervals between successive exposures.

The primary difference between the test range and the training range lay in the nature of the terrain and the consequent obscurity of the targets. The training range terrain was flat, open, and clear of brush and trees. Clearly silhouetted training targets were sited in rows across the range, with each easily located within its respective narrow firing lane. By contrast, the test

range was wooded. The terrain initially sloped downward to a lateral swamp line at approximately 150 yards, then gradually rose with the ground covered by brush, trees, and high grass. On this range all targets at any single range were irregularly aligned, necessitating that within each firing lane every target had to be individually detected, primarily through its movement, as it rose into position.

A total of 56 targets were presented to the firer, with a consequent possible hit score of 56. Thirty-two of these targets were fired upon from the supported standing-foxhole position and 24 targets from a hastily assumed unsupported position of the firer's choice as he advanced down range. After each series of eight targets, weapons were cleared and a fresh clip loaded so that a firer would not be penalized by having to reload after the targets appeared.

A trainee would initially fire from one of the four lanes on either the left or right half of the firing line and subsequently rotate over three other lanes.^{1/} This was done to insure that trainees were not learning specific locations of targets, and to insure the maximum uniformity of the test fired by each individual.

^{1/} As an example, a trainee starting on point 3 would fire one clip of 8 rounds at the 8 targets in this lane, then move in turn to points 4, 1, and 2 at each of which he would repeat the procedure. He would next proceed to the 50 yard line at point 3 and fire an 8 round clip while moving forward, then to the 50 yard line of point 4 and fire another clip, and finally to the 50 yard line at point 1 to fire his last clip.

Each firing point had a scorer who also served as a safety man. To insure comparability of firing conditions, the experimental and conventional groups were equally represented in each firing order and on each firing point.

RESULTS

Major results indicate that the experimental group detected a significantly greater number of targets than did the conventionally trained group ($p < .01$); that the average point score weighted relative to the phase of detection was significantly better for the experimental group than for the conventional group ($p < .01$); and that the experimental group hit a significantly greater number of targets than did the conventional group ($p < .01$) on the first test of marksmanship (see Tables 1, 2 and 3, in Appendix).

As an incidental finding, on the Known Distance Record Range a greater percentage of the conventionally trained group were classified as expert in their Rifle Marksmanship Qualification although the experimental training produced a higher total percentage of men who reached the requirements for qualification (see Table 4 in Appendix).

DISCUSSION

After the first four weeks of training, the conventional group and the experimental group were given target detection and marksmanship proficiency tests. The target detection data were analyzed for mean number of targets detected and for the phase in which the target was detected. Weights were assigned to the phases

with phase 1 given four points; phase 2, three points; phase 3, two points; and phase 4, one point. Marksmanship data were analyzed for number of targets hit. Comparisons of performance after the first four weeks of training showed the experimental group to be significantly better ($p < .01$) than the conventional group on all of these measures.

These results support the conclusion that the revised TRAINFIRE I program is a more effective course of basic individual rifle marksmanship than is the conventional program.

The firers were categorized according to their Rifle Marksmanship Qualification scores which they obtained on the record firing. A higher total percentage of the experimental group than of the conventional group obtained qualifying scores (Marksman, Sharpshooter, or Expert). However, a greater percentage of the conventional group than of the experimental group were classified as expert. From the Army viewpoint this established that men trained under the TRAINFIRE system reach acceptable standards of proficiency in spite of their lack of practice in the conventional sustained rapid firing exercises (time pressure firing).

SUMMARY AND CONCLUSIONS

The original TRAINFIRE I program of rifle marksmanship was revised on the basis of information gained from its administration. To evaluate these revisions, an experimental group of trainees was

given revised TRAINFIRE I training and a conventional group was given known distance rifle marksmanship instruction. Comparisons were made between group performances resulting from the two individual marksmanship programs.

It was concluded that:

1. The revised TRAINFIRE I training program leads to a significantly greater:
 - a. Number of targets detected
 - b. Detection of targets in an earlier phase
 - c. Number of targets hit
2. The revised TRAINFIRE I training program produces a higher percentage of men who reach the requirements for Rifle Marksmanship Qualification on the Known Distance Record Range although a greater percentage of the conventionally trained group reach the classification of expert.

APPENDIX

Table 1

Number and Percentage of Targets Detected in Each of the Four Phases - First Proficiency Test									
	<u>Experimental Phase</u>				Nr Targets Detected	<u>Conventional Phase</u>			
	<u>1</u> <u>120</u>	<u>2</u> <u>487</u>	<u>3</u> <u>824</u>	<u>4</u> <u>1206</u>		<u>1</u> <u>106</u>	<u>2</u> <u>410</u>	<u>3</u> <u>748</u>	<u>4</u> <u>1121</u>
Nr Targets Detected	120	487	824	1206		106	410	748	1121
% Detected	9.2	37.2	63.0	92.2		8.2	31.6	57.7	86.5

Table 2

<u>"t"</u> Tests Between Means of Groups for Number of Targets Detected and Targets Weighted for Phase of Detection - First Proficiency Test						
<u>Number of Targets Detected</u>	<u>t*</u>	<u>df</u>	<u>p</u>	<u>Mean</u>	<u>s</u>	
Experimental	6.16	214	<.01	10.8	1.1	
Conventional				9.5	2.0	
<u>Targets Weighted for Phase of Detection</u>						
Experimental	4.86	214	<.01	24.2	5.1	
Conventional				20.8	5.6	
* All "t" tests are 2-tailed						

Table 3

"t" Tests Between Means of Groups for Number of Hits					
<u>1st Marksmanship Proficiency Test</u>	<u>t*</u>	<u>df</u>	<u>p</u>	<u>Mean</u>	<u>s</u>
Experimental	4.6	216	<.01	27.7	6.8
Conventional				23.7	6.2
* "t" test is two-tailed					

Table 4

Percentage of Trainees Obtaining Qualification Scores on the Known Distance Record Range		
	<u>Experimental</u> <u>(Platoon 1, Only)</u>	<u>Conventional</u>
	<u>Percent</u>	<u>Percent</u>
Expert (over 29 hits)	2	9
Sharpshooter (23-29 hits)	36	25
Marksman (16-22 hits)	58	57
Unqualified (less than 16 hits)	4	9

USAIRRU Research Memorandum 8

December 1958

ERRATA - February 1959

The following information is applicable to the Appendix of United States Army Infantry Human Research Unit Research Memorandum 8, Extension of Research in TRAINFIRE I Basic Rifle Marksmanship Course, dated December 1958.

Table 4, page 20, should read as follows.

Table 4

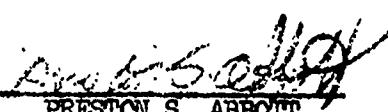
Percentage of Trainees Obtaining Qualification Scores on the Known Distance Record Range		
<u>Qualifying Scores on Known Distance Record Range</u>	<u>Experimental</u> <u>(Platoon 1, Only)</u>	<u>Conventional</u>
	<u>Percent</u>	<u>Percent</u>
Expert (212-250 points)	2	9
Sharpshooter (187-211 points)	36	25
Marksman (160-186 points)	58	57
Unqualified (0-159 points)	4	9

Table 5, presenting the following information, should be added in the Appendix.

Table 5

<u>Qualifying Scores on the TRAINFIRE Record Range</u>	<u>Percentage of Trainees Obtaining Qualification Scores on the TRAINFIRE Record Range</u>	
	<u>Experimental</u>	<u>Conventional</u>
	<u>Percent</u>	<u>Percent</u>
Expert (over 29 hits)	42	16
Sharpshooter (23-29 hits)	33	46
Marksman (16-22 hits)	24	27
Unqualified (less than 16 hits)	1	12

On the TRAINFIRE Record Range, not only did a greater percentage of the TRAINFIRE trained men qualify but also a greater percentage of them qualified as expert.


PRESTON S. ABBOTT
Director of Research

U.S. Army Infantry
Human Research Unit
Fort Benning, Georgia

Employment of Mines (20 minutes).

b. The above films will be shown in the Unit Conference Room (Bldg 1013) at 1030 hours, 11 Feb 59.

6. MEETING OF MILITARY PERSONNEL: The weekly meeting of Military Personnel of this unit will be held at 1130 hours, 11 Feb 59 in the Unit Conference Room, building 1013. This meeting includes all Military Personnel, both officer and enlisted, assigned and attached to this unit.

7. WEEKLY BULLETIN ITEMS: Items appearing in the Official Section, USAIRU Bulletin, have the force and effect of official orders of the Chief, USAIRU. Military Personnel are responsible for compliance with information contained therein.

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